REMARKS

The Applicants respectfully request reconsideration of the finality of the Office action mailed 05/09/2003. The Applicants believe the finality of this Office action is premature in light of the new grounds of rejection that do not appear to be necessitated by the Applicants' amendments, and a clear issue between the Applicants and the Examiner has not yet been developed for appeal.

Claims 17, 18, and 22-31 were previously cancelled. Claims 1-16 and 19-21 are pending. Claims 1-4, 7-16, and 19-21 stand rejected and claims 5 and 6 are allowed. Claim 9 stands objected to as being dependent upon a rejected base claim, but as being allowable if rewritten in independent form. The Applicants sincerely thank the Examiner for allowing claims 5 and 6 and for indicating the allowability of claim 9.

Claims 8, 9, 11, and 19-21 are amended. Claim 8 is amended to change dependency from claim 1 to claim 7. Claim 9 is rewritten in independent form to incorporate the limitations of the base claim, as indicated by the Examiner. Claim 19 is amended to more particularly point out the invention. Support for the amendments to claim 19 is found in Fig. 3E and the associated written description. Claim 20 has been amended to improve the form of the claim by conforming the claim language to terms used in the written description and other claims. Claim 21 has been amended to conform claim language to the written description on page 11, line 19. The undersigned believes these amendments do not add new matter.

The written description is amended to correct misspellings and other obvious errors. The undersigned believes these amendments do not add new matter.

Rejection under 35 U.S.C. § 112

Claim 8 stands rejected under 35 U.S.C. § 112 because there is insufficient antecedent basis for the recited limitation "the mechanical latch". Claim 8 has been amended to change dependency from claim 1 to claim 7. Claim 7 provides the required antecedent basis for the mechanical latch, which the undersigned believes overcomes this rejection.

Rejections Under 35 U.S.C. § 102(b)

Claims 19 and 20 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 3,769,531 to Elkuch (hereinafter "Elkuch"). The Examiner cites Elkuch for disclosing an electrostatic actuator with an electrode having a short portion and a tall portion at the tip of the electrode, where the tall portions are adjacent to each other. The Examiner states that the movable element 20 with a short and tall portion moves from a first and second position relative to the base.

Claim 19, as amended, recites, among other elements, a movable finger attached to the movable element and opposed to the fixed finger, the movable finger having a second short portion proximate to the movable element and a second tall portion distal from the movable element so that the movable element is pulled toward the base when an electric potential is applied between the fixed finger and the movable finger. In the electro-mechanical oscillator disclosed in Elkuch, the electric potential is applied between the outer electrodes **18**, **19**, and not to the movable electrode **20** (*see* Figs. 1 and 2, and Col. 2, lines 12-17). Elkuch states that the movable electrode **20** is "totally insulated from the other parts" (Col. 2, line 22) unless it is attracted to, and touches, an outer electrode (Col. 2, lines 36-43). Thus the movable element is not pulled toward the base when an electric potential is applied between the fixed finger and the movable finger.

Furthermore, the Examiner indicates that the movable electrode **20** and the through connection **8** are equivalent to the movable element and base recited in claim 19. However, the movable electrode **20** is not pulled toward the base when an electric potential is applied between the fixed finger and the movable finger. Similarly, the electrodes disclosed in Elkuch do not oppose each other. Therefore, the Applicants believe claim 19 and all claims that depend from claim 19 are allowable.

Rejections Under 35 U.S.C. § 103

Claim 21, which depends from claim 19, stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Elkuch. The Examiner states that Elkuch teaches every aspect of the invention except the height of the electrodes, and that it would have been obvious to a person of ordinary skill in the art to construct the actuator of Foster with the tall electrodes height being at least 2x the small electrodes to optimize the performance of the

actuator. The Applicants do not believe Foster qualifies as prior art against this claim for the reasons discussed in the Amendment mailed 02/06/2003.

However, even if Foster is prior art, which the Applicants believe it is not, the Applicants respectfully traverse this rejection. Claim 21, which depends from claim 19, recites, as amended, that the first tall portion is at least three times as high as the first short portion. Fig. 1 of the mechanical vibrator of Elkuch appears to be a plan view that shows the width of the support **25** and electrode **18**, but does not disclose a fixed finger of an electrostatic comb drive having a short portion and a tall portion, as shown in Fig. 3E of the present application.

The Examiner states that discovering the optimum workable ranges involves only routine skill when the general conditions of the claim are disclosed in the prior art. However, Elkuch does not recognize that the relative heights of short and tall portions of a finger are a result-effective variable in an electrostatic comb drive. The relative heights must first be recognized as a result-effective variable, *i.e.* a variable that achieves a recognized result, before the determination of the optimum or workable ranges of the variable might be characterized as routine experimentation.

The present application teaches that a tall portion that is at least three times the height of a short portion of a finger in an electrostatic comb drive facilitates bidirectional electrostatic action of the electrostatic comb drive (Page 11, lines 19-20). There is no such teaching or suggestion in Elkuch. Accordingly, the Applicants believe claim 21 is further patentable.

Claims 1-3, 10, 11, 13, and 14 stand rejected as being unpatentable over US Patent No. 5428, 259 by Suzuki (hereinafter "Suzuki") in combination with JP 2000-266777 by Sugiyama et al. (hereinafter Sugiyama). The Examiner states that Suzuki teaches an electrostatic actuator with variable thickness electrodes (Fig. 3), and that the shape of the electrode determines the performance of the actuator. The Examiner further states that Suzuki does not teach thick portions on the distal end and thin portions near the base, and that Sugiyama teaches thick portions on the distal end and thin portions near the base to reduce capacitance variation rate. The Examiner asserts that it would have been obvious to one of ordinary skill in the art to construct the actuator of Suzuki with the thick/thin portions of Sugiyama. The Applicants respectfully traverse this rejection.

Claim 1 recites, among other elements, a spring disposed between the base and the movable element configured to provide a potential energy maximum between a first position and a second position of the movable element relative to the base. The Examiner's attention is directed to Figs. 1C and 2A of the instant invention, which illustrate the potential energy maximum. As taught in the written description, when the movable element overcomes the local energy maximum **48**, the movable element moves toward one of the local energy minima **44, 50** as the potential spring energy is converted to kinetic energy. The movable element is bi-stable and remains at a position associated with one of the local energy minima, even in the absence of an applied voltage.

Suzuki discloses a vibration-type sensor, but neither Suzuki nor Sugiyama discloses or suggests the recited spring. Suzuki states that the movement of the movable electrode toward the fixed electrodes is balanced by the opposite force given by the stiffness of the folded beams **15** (Col. 11, lines 10-13). In relation to Fig. 4, Suzuki states that when the movable electrode **40** moves in the right and left directions, the folded beams **44** and straight beams **43** tend to restrain the movements and return the movable electrode to its original position (Col. 11, lines 52-56, *emphasis added*). It is the Applicants' position that modifying the vibration-type sensor disclosed in Suzuki to include the recited spring would change the operation of the vibration-type sensor, possibly rendering it unsuitable for its intended use. The Applicants believe that Suzuki teaches away from the present invention by disclosing a spring that returns the movable electrode to its original position.

The Examiner states that it would have been obvious to construct the actuator of Suzuki with the thick/thin portions of Sugiyama to reduce the capacitance variation between the electrodes. The Applicants respectfully traverse.

Sugiyama states the electrodes of the capacitive sensor have thick and thin portions, which are advantageous because this increases the capacitance variation without changing the chip size to obtain a highly sensitive electrostatic capacitive sensor. Fig. 3 of Suzuki shows tapered fixed electrodes and straight movable electrodes. The thick portion of the electrode is near the base, and the thinner portion near the tip. Suzuki states that the electrostatic force acting on a unit length of the movable electrode increases in inverse proportion to the distance between both electrodes, and that the

movable electrode tends to go into the depth of the fixed electrodes (Col. 11, lines 4-8). Suzuki further states that this is desirable because the device can be driven by a smaller force. Sugiyama shows the thick portions near the tip of the electrode, and the thin portions near the base.

Modifying the tapered electrodes disclosed in Suzuki to include the corrugations disclosed in Sugiyama would not achieve electrostatic force acting on a unit length of the movable electrode that increases in inverse proportion to the distance between both electrodes. The proposed modification cannot render the prior art unsatisfactory for its intended purpose or change the principle of operation of a reference. The Applicants believe Suzuki teaches away from the proposed modification and that claim 1 and all claims that depend from claim 1 are patentable.

Claim 10, which depends from claim 1, further recites a voltage supply configured to provide a first voltage pulse to toggle the movable element from the first position to the second position and to provide a second voltage pulse to toggle the movable element from the second position to the first position wherein the first voltage pulse and the second voltage pulse are essentially the same. Toggling the movable element back and forth in response to essentially identical voltage pulses simplifies operation of the electrostatic comb drive and is particularly desirable, as discussed in the brief summary of the invention on page 3, lines 27-31 and in the written description on page 8, lines 12-17 and page 10, lines 9-12. The vibration-type sensor of Suzuki and the capacitive sensor of Sugiyama both appear to have elastic elements that return the movable elements to an original position absent an applied voltage. Thus it appears that neither device would toggle between a first position to a second position in response to a first voltage pulse, and toggle from the second position back to the first position in response to a second voltage pulse. Therefore, the Applicants believe claim 10 is further patentable.

Claim 11, as amended, recites, among other elements, a movable element movably connected to the base and configured to move from an initial position to a latched position relative to the base, and that the second wide portion is drawn in a first direction toward the first wide portion from the initial position toward the latched position when a first voltage pulse is applied between the fixed finger and the movable

finger, and is drawn in a second direction toward the first wide portion from the latched position when a second voltage pulse is applied between the fixed finger and the movable finger, the first direction being opposite to the second direction. Furthermore, shaping the fingers as claimed enables a single voltage pulse to accelerate and then decelerate the movable portion, as taught in Figs. 2B and 3A-3C, and the associated text. Neither reference appears to teach or suggest the electrostatic comb drive of claim 11, and the Applicants believe that claim 11 and all claims that depend from claim 11 are allowable.

Claims 7, 8, 12, and 16 stand rejected as being unpatentable over Suzuki and Sugiyama in further view of U.S. Patent No. 6,360,033 by Lee et al. (hereinafter "Lee"). The Examiner states that Suzuki and Sugiyama disclose every aspect of the invention except the latch springs and the pulsed operating voltage. The Examiner cites Lee for disclosing an electrostatic actuator with latch springs, and states that it would have been obvious to construct the actuator of Suzuki and Sugiyama with the latch springs of Lee to operate as a switch with low power consumption.

In Fig. 1, Suzuki shows a vibration-type sensor and states that movable electrode 12 vibrates according to a switching rate (Col. 8, lines 61-63). A vibrating movable electrode appears to be central for the operation of the sensor. The proposed modification cannot render the prior art unsatisfactory for its intended purpose. Modifying the vibration-type sensor to include latch springs would render it unsatisfactory for its intended purpose because latch springs would interfere with the vibration of the movable electrode.

Similarly, the proposed modification cannot change the principle of operation of a reference. The capacitive sensor of Sugiyama uses corrugated electrodes so that the reduction in the capacitance variation rate is suppressed during relative displacement of electrodes. The operation of the capacitive sensor does not appear to involve electrically moving the movable electrode, but rather mechanically moving the movable electrode and measuring the capacitance between the movable and fixed electrodes. Hence, there is no motivation to operate the capacitive sensor as a switch with low power consumption. Furthermore, adding latching springs to the capacitive sensor would interfere with the operation of the capacitive sensor.

Conclusion

The Applicants recognize that the Examiner has discretion in entering an amendment after final rejection, and believes that the present amendment is sufficiently focused to be appropriate for entry. The previous amendment is believed to have been fully responsive to the rejection, and it is believed that the Examiner's response to the previous amendment set the stage for Applicants to respond directly to the Examiner's concerns. This amendment is not believed to require additional search or raise new issues and entry is respectfully requested to provide the Applicants a full and fair hearing.

In view of the foregoing and upon entry of this amendment, the Applicants believe all claims pending in this Application will be in condition for allowance, and that the Applicants are entitled to the claims in accordance with the Title 35 of the United States Code and Art.1, §8, cl.8 of the Constitution of the United States. The Applicants respectfully request reconsideration of the finality of the Office action and of all pending claims, the withdrawal of all rejections, and the issuance of a formal Notice of Allowance at an early date.

If the Examiner believes this amendment does not put all pending claims in condition for allowance, or does not agree that the finality of the Office action should be withdrawn, the undersigned invites the Examiner to telephone him at (707) 591-0789.

Respectfully submitted,

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